REMARKS

The Office Action mailed March 1, 2010, has been received and its contents carefully noted. Claims 1-12 were pending. Claims 1-12 were rejected. By this response claims 1, 5 and 6 have been amended, claims 3-4 have been canceled and claim 13 is newly added. Support may be found in the specification and the claims as originally filed. See, for example, original claim 3, and paragraphs [0012] and [0022] of the specification as originally filed. No statutory new matter has been added. Therefore, reconsideration and entry of the claims, as amended, are respectfully requested.

The Claimed Invention

As described at paragraph 0004 of the instant specification, conventional two-fluid nozzles for cleaning substrates generate injected liquid drops with largely varying diameters, which drops, when injected onto the surface of a wafer, risk damaging the surface of the wafer. As also described at paragraph 0005 of the instant specification, liquid droplets from conventional two-fluid nozzles have many different injection speeds, which results in high speed liquid droplets that likewise elevate the risk of damaging the surface of a wafer, and also low speed liquid droplets that have poor performance in removing contaminants.

The claimed invention, as set forth in claim 1, and new claim 13, is directed to solving these problems in the prior art. Specifically, as described in paragraph 0029 of the instant application, in order to atomize liquid drops and make their speed uniform, the cross-sectional area Sc of the exit (narrowed portion 31) of the gas supply passage 21 is made equal to the cross-sectional area Sb of the injection port 24, or is made smaller than the cross-sectional area Sb of the injection port 24. This increases the N2 flow speed at the mixing portion of the N2 gas and the pure water.

In addition, as described in the paragraph 0022, since the injection port 24 is formed in an orifice shape with a cross-sectional area smaller than that of the lead-out passage 23 (see FIG. 3), even when liquid drops grow along the inner wall of the lead-out passage 23 (when passing through the lead-out passage 23), they are atomized again while passing through the injection port 24.

Rejection under 35 U.S.C. 103(a)

The Examiner rejected claims 1-12 under 35 U.S.C. 103(a) as being unpatentable over Hirose (US 20030079764) in view of Tateyama (JP 2001252604). Applicants respectfully submit that Hirose, alone or in combination with Tateyama, does not teach or suggest the claimed invention. Specifically, the present invention, as claimed, has an injection port which re-atomizes liquid drops that have grown, e.g. the injection port 24 is formed in an orifice shape with a cross-sectional area smaller than that of the lead-out passage 23.

Nowhere does Hirose teach or suggest such a structure or its effect on re-atomizing liquid drops. Although Hirose discloses a "passage 45a" that has a constant cross-sectional area (FIG. 7), from the upper end to the opening at the lower end where N2 and water are mixed and supplied, nowhere does Hirose describe either the shape of the injection port at the lower end or the cross-sectional area. When the cross-sectional area of the passage is constant as shown in FIG. 7, liquid drops grow easily along the inner wall, while passing through the lead-out passage.

Tateyama does not alleviate the deficiencies of Hirose. As described in paragraph 0042 of Tateyama, the discharge mouth 63 is shaped such that its outer diameter is gradually reduced. This is to prevent the porous body 64, having a water retention ability and provided for preventing dripping of liquid, from falling when the treatment solution is discharged as described in Tateyama's paragraph 0043, but that is not a requirement for discharge of the treatment solution. It is described that "the inner diameter of the discharge mouth 63 may be equal to or greater than that of the solution sending pipe 61".

Thus, the combination of Hirose and Tateyama does not result in an injection port which re-atomizes liquid drops that have grown as set forth in the claims.

In addition, as set forth in the instant claims, there is no obstacle like the porous body existing at the front end of a lead-out passage, which thereby allows liquid drops to be injected (as they are) from the injection port. Further, according to the present invention, the lead-out passage (with the cross-sectional area Sa) is formed in a straight shape, the cross-sectional area Sb of the injection port is smaller than the cross-sectional area Sa of the lead-out passage, and the cross-sectional area Sb is formed constant, so that the joint portion between the lead-out passage

and the injection port is formed in a stepped shape. Thus, even if the liquid drops have grown largely while moving along the inner wall of the lead-out passage, the liquid drops are atomized again while passing through the injection port, and the particle diameters and the injection speeds of the liquid drops can be made uniform. Also, as described in the paragraph 0044, since large liquid drops divide into plural liquid drops in the injection port, the number of liquid drops increases, so that a large number of fine-particle liquid drops can be injected to the wafer at a favorable injection speed.

Tateyama has no description of the lead-out passage being formed in a straight shape, the cross-sectional area of the injection port being smaller than the cross-sectional area of the lead-out passage, and the cross-sectional area of the injection port being formed constantly. Instead, the nozzle of Tateyama has a shape with an inclination toward its front end.

Moreover, according to claim 1, as amended, the N2 flow speed is increased at the mixing portion of the N2 gas and the pure water to thereby atomize the liquid drops and make the speed uniform by making the cross-sectional area Sc of the gas supply passage 21 equal to the cross-sectional area Sb of the injection port 24, or smaller than the cross-sectional area Sb of the injection port 24.

Tateyama does not teach or suggest anything about the relationship between the cross-sectional area of the gas supply passage and the cross-sectional area of the injection port, or any means that would re-atomize liquid drops passing through the lead-out passage in accordance with the instant invention as claimed.

Since the cited documents, alone or in combination do not teach or suggest the claimed invention, Applicants respectfully submit that the claims, as amended, are unobvious and the rejection under 35 U.S.C. 103(a) should be withdrawn.

Request for Interview

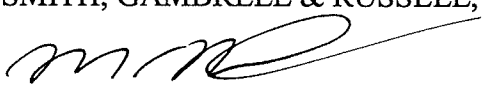
A telephonic or an in-person interview is respectfully requested should there be any remaining issues.

CONCLUSION

All of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Therefore, it is respectfully requested that the Examiner reconsider all presently outstanding rejections and that they be withdrawn. It is believed that a full and complete response has been made to the outstanding Official action and, as such, the present application is in condition for allowance. If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided.

It is not believed that extensions of time are required, beyond those that may otherwise be provided for in accompanying documents. However, in the event that additional extensions of time are necessary to prevent abandonment of this application, then such extensions of time are hereby petitioned under 37 C.F.R. 1.136(a), and any fees required therefor are hereby authorized to be charged to **Deposit Account No. 02-4300, Attorney Docket No. 033082M341**.

Respectfully submitted,
SMITH, GAMBRELL & RUSSELL, LLP



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